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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the image forming device which breathes out ink from the delivery of the printhead carried in the carriage, and forms a picture in printing media, such as a recording form.

[0002]

[Description of the Prior Art] The ink-jet imaging device which breathes out ink and forms a picture in a recording form as one of the output units of a computer or a workstation is known. This ink-jet imaging device equips the printhead in which the delivery in which ink carries out the regurgitation was formed, for example, the carriage which carries this printhead and reciprocates to a determined direction, and the transportation direction which intersects perpendicularly with this determined direction with the conveying machine which conveys a recording form.

[0003] Stopping the recording form under conveyance temporarily with a conveying machine, and making a carriage reciprocate to the above-mentioned determined direction, when forming a picture in a recording form. Based on the picture signal which supported picture information, ink is breathed out from a delivery, and the picture for one band is formed in the portion located in the image formation area in which a picture is formed among recording forms. Then, only the width for one band making a transportation direction convey and suspend a recording form, and making the determined direction which described the carriage above reciprocate again, based on a picture signal, ink is breathed out from a delivery and a picture is formed in the portion newly located in an image formation area among recording forms. A picture is formed in a recording form by repeating such operation.

[0004] In such an image forming device, the size of a picture and the size of printing media, such as a recording form with which this picture is formed, are made to agree generally, and a picture is formed. That is, the width and length of a printing medium, and the width and length of a picture are doubled, and a picture is formed. Usually, since the size of a picture is beforehand known when outputting it, it is necessary to detect the size of the printing medium laid in the image forming device. For this reason, the sensor which detects a printing medium is installed on the outskirts of a printing medium passing through, and the size of a printing medium is detected. For example, the sensor which detects a printing medium is installed in two places at the platen which lays or passes, and by these sensors, a printing medium detects the tip position and rear end position of a printing medium, and is detecting the length. The sensor which detects a printing medium is installed in the carriage which reciprocates the upper part of a printing medium, and the width of a printing medium is detected by this sensor.

[0005]

[Problem(s) to be Solved by the Invention] As mentioned above, conventionally, in order to detect the length of a printing medium, the sensor is installed in two places of a platen, and the end position of the tip of the transportation direction of a printing medium and the back end, i.e., length, is detected by these two sensors. However, when detecting the end

position of a printing medium using two sensors in this way, the composition for detecting the end position of a printing medium becomes mechanically, electrically, and complicated.

[0006]An object of this invention is to provide the image forming device which can detect the end position of a printing medium with easy composition in view of the above-mentioned situation.

[0007]

[Means for Solving the Problem]An image forming device of this invention for attaining the above-mentioned purpose, A printhead in which two or more deliveries in which ink carries out the regurgitation from each were formed, Ink is breathed out from said two or more deliveries, having a carriage which carries this printhead and reciprocates to a determined direction, and making this carriage reciprocate to said determined direction, In an image forming device which forms a picture in a printing medium conveyed in a transportation direction which intersects said determined direction, (1) It had a printing-medium detection means carried in said transportation direction upstream portion rather than said printhead among said carriages which detect width as the length of a printing medium currently conveyed in said transportation direction.

[0008]Here, as for said printing-medium detection means, it is preferred to be carried in a position which is distant from said 1st delivery beyond distance which met said transportation direction of the 1st delivery nearest to said printing-medium detection means and the 2nd most distant delivery among said two or more deliveries.

[0009]

[Embodiment of the Invention]Hereafter, with reference to drawings, one embodiment of the image forming device of this invention is described.

[0010]Drawing 1 is a perspective view showing the outline composition of the plotter which is an example of the image forming device of this invention, and drawing 2 is a perspective view in which cutting a part of plotter of drawing 1 into, and showing the conveying path of a printing medium.

[0011]The plotter 1 is being fixed to the upper part of the stand 2. The plotter 1 is provided with the control panel 3 for operating this plotter 1, and can direct paper size, on-line/off-line, a command, etc. with the various switches etc. which have been arranged at the control panel 3. The printing medium 4 is inserted from the direction of arrow A, is \*\*\*\*(ed) by the pinch roller 5 and the grid roller 6 in which press/release is free, and is conveyed in the plotter 1 based on the directions from the control panel 3. If the back end at the time of installation of the printing medium 4 inserted in the direction of arrow A is detected by the printing-medium presence detecting sensor 111 (refer to drawing 2) arranged to the front rather than the pinch roller 5 and the grid roller 6, it will stop conveyance of the printing medium 4. Then, the printing medium 4 is conveyed in the direction (the direction of arrow A') opposite to the direction of arrow A, and a picture is formed. The printing medium 4 with which the picture was formed is discharged in the direction of arrow A', and is accommodated in the stacker 7.

[0012]With reference to drawing 2, the conveying path and printing (image formation) process of the printing medium 4 are explained. The plotter 1 is an image forming device printed to the sheet shaped printing medium 4 pinched by the pinch roller 5 and the grid roller 6.

[0013]In forming a picture in the printing medium 4, first, carry out the leveling up of the

printing medium 4 on the platen 8, and the pinch roller 5 and the grid roller 6 are made to pinch it, and it is inserted in the direction of arrow A. If the back end of the printing medium 4 inserted in the direction of arrow A is detected by the printing-medium presence detecting sensor 111 arranged in the pinch roller 5 and about six grid roller, it will stop conveyance of the printing medium 4. Then, the printing medium 4 is conveyed in the direction (the direction of arrow A') opposite to the direction of arrow A, and a picture is formed in the printing medium 4 in the printing area 8b of the platen 8. The printing medium 4 with which the picture was formed is discharged in the direction of arrow A', and is accommodated in the stacker 7.

[0014]The plotter 1 is provided with the carriage 9 which reciprocates in the direction (it is an example of the determined direction said to this invention) of arrow B which intersects perpendicularly with the transportation direction (the direction of arrow A) of the printing medium 4. The carriage 9 has the head holder 10 and the head holder 10 is equipped with the printhead 11 which stored ink. The carriage 9 is being fixed to the belt 12 ~~\*\*\*\*~~(ed) by the carriage drive motor (graphic display ~~\*\*\*\*~~). The belt 12 reciprocates in the direction of arrow B, and it is shown to it also to the carriage 9 by reciprocal rotation of a carriage drive motor with reciprocation of the belt 12 at the guiding rails 13 and 14, and it reciprocates in the direction of arrow B by it.

[0015]The linear scale 16 is arranged at the range of reciprocation of the carriage 9. The graduation equivalent to the resolution of a picture is minced by the linear scale 16. Based on the position signal from the linear sensor (not shown) carried in the carriage 9, ink breathes out from the deliveries 11a, 11b, and 11c formed in the printhead 11, ....11x (refer to drawing 3), and a picture is formed in the printing medium 4. The printing medium 4 is intermittently conveyed in the direction of arrow A'. In forming a picture in the printing medium 4, stopping the printing medium 4 temporarily and making the carriage 9 reciprocate in the direction of arrow B, ink is made to breathe out from the deliveries 11a, 11b, and 11c and ....11x in the printing area 8b based on a print signal, and the picture for one band is formed. Then, only predetermined length conveys the printing medium 4 and a picture is formed in the new portion located in the printing area 8b at the part for a following band. A picture is formed in the printing medium 4 by covering the overall length of the printing medium 4 and repeating this operation.

[0016]The carriage 9 is explained with reference to drawing 3.

[0017]Drawing 3 is a bottom view showing the carriage 9.

[0018]Two or more deliveries 11a, 11b, and 11c in which ink carries out the regurgitation from each, and the printhead 11 in which ....11x was formed are carried in the carriage 9. Here the delivery 11a is the 1st delivery said to this invention, and the delivery 11x is the 2nd delivery said to this invention. The printing-medium detection sensor (it is an example of the printing-medium detection means said to this invention) 20 which detects the back end and width at the time of printing of the printing medium 4 (refer to drawing 2) currently conveyed in the direction of arrow A' is carried in the carriage 9. For this reason, since the size (the back end and width at the time of printing) of the printing medium 4 (refer to drawing 2) is detectable by the one printing-medium detection sensor 20, between two sensors installed in the platen, one piece becomes unnecessary and can detect the size of a printing medium with an electric target or mechanically easy composition.

[0019]The above-mentioned printing-medium detection sensor 20 is the composition of

the common knowledge provided with the light emitting device and the photo detector, and is carried in the transportation direction (direction of arrow A') upstream portion rather than the printhead 11 among the carriages 9. The printing-medium detection sensor 20 is carried in the position which is distant from the delivery 11a beyond two or more deliveries 11a, 11b, and 11c and the distance E which met the transportation direction of the delivery 11a nearest to the printing-medium detection sensor 20, and the most distant delivery 11x among ....11x. That is, the distance L of the printing-medium detection sensor 20 and the delivery 11a is the same as the distance E, or longer than the distance E. Therefore, the interval for at least 1 band will be between the printing-medium detection sensor 20 and the delivery 11a. For this reason, when the back end of the printing medium 4 (refer to drawing 2) is not detected by the printing-medium detection sensor 20, Based on the signal which supports that this back end is not detected, after forming the picture for one next band, the dirt of the platen 8 in the ink breathed out into the portion which does not have a printing medium accidentally can be prevented by suspending image formation.

[0020]With reference to drawing 4 and drawing 5, it explains overall flowing into operation of the plotter 1.

[0021]Drawing 4 is a block diagram showing the outline composition of the plotter 1, and drawing 5 is a flow chart showing the printing operation by the plotter 1.

[0022]the plotter 1 is turned on (not shown) and the plotter 1 is started -- making (S151) - an initial setting is performed by the instructions from MPU106 (S152). By this initial setting, the active position of all the members of the plotter 1 returns to an initial state. For example, the printhead 11 is cleaned, it is detected whether a carriage etc. are located in a home position, or each device is initialized.

[0023]An end of an initial setting will perform checking operation of the printing-medium existence which detects the existence of the printing medium 4 (refer to drawing 2) with the printing-medium presence detecting sensor 111 currently installed in the platen (S153). Here, the printing-medium presence detecting sensor 111 detects the existence of the printing medium 4.

[0024]The state of the printing-medium presence detecting sensor 111 is supervised by MPU106, if the printing medium 4 is detected, a printing-medium loading instruction will be inputted into MPU106 from the control panel 3, and the existence of a load request will be judged (S154). If judged with MPU106 having a load request, printing-medium loading operation will be performed in MPU106 (S155). Printing-medium loading operation means the operation which conveys the printing medium 4 in the direction of arrow A, measures the back end of the printing medium 4 with the printing-medium presence detecting sensor 111, and measures width by the printing-medium detection sensor 20 carried in the carriage 9. After printing-medium loading operation is completed, the back end of the measured printing medium 4 and width are memorized by the main memory 105, and the size except the tip (back end at the time of printing) of the printing medium is specified (coordinate system construction operation). Then, many setting out of the image formation operation which is many setting out changed before setting up printing-medium load processing of print mode etc. is performed (S156).

Thereby, the plotter 1 will be in a printing possible state.

[0025]If the plotter 1 will be in a printing possible state, image data will be inputted into the plotter 1 via the I/O interfaces 102 (for example, RS232C, Centronics, LAN, etc.)

from the image data output devices (a personal computer, CAD, etc.) 101. If image data is inputted, the image data processing part 104 will receive image data, and image data will be changed into the printing data 103 printable by the image data processing part 104.

[0026]Although the printing data 103 is saved at the main memory 105, if conservative quantity turns into a predetermined quantity, it will be required that printing should be started from the image data processing part 104 to MPU106, and the existence of a printing starting request will be judged (S157). If a printing starting request is judged to be owner \*\*, printing pretreatment, i.e., head cleaning, and setting out of each device will be performed (S158). An end of this printing pretreatment will start printing processing (S159). Printing processing is performed by controlling the printing data formed by the image data processing part 104 by the control part print 108 based on the printing pulse into which it was inputted from the linear scale 16. If the signal which terminates printing was inputted into MPU106, after the changed printing data 103 will be printed, print end processing of head cleaning, printing-medium discharge processing, setting out of each device, etc., etc. is performed (S160), and operation of the plotter 1 is completed.

[0027]In performing printing processing (S159) shown in drawing 5, it may print in the case where it prints by either movement to the plus direction, or movement to a backward direction among reciprocation of the carriage 9 which carries the printhead 11 (refer to drawing 3), and the both directions of reciprocation. The former is called uni-directional printing and the latter is called bidirectional printing.

[0028]With reference to drawing 6, uni-directional printing is explained first.

[0029]Even if the distance of the printhead 11 and the printing-medium detection sensor 20 which are shown in drawing 3 in uni-directional printing makes distance L longer than the distance E and it shortens it, it does not have a problem. This is because it is early detectable rather than carrying out the regurgitation of the back end of a printing medium passing and there being no printing medium if it is in the position which the printing-medium detection sensor 20 precedes from the delivery 11 at the time of a printing scan.

[0030]The printing-medium detection sensor 20 carries out detection operation of the printing medium 4 to go into printing processing (S201). This reason is for judging whether the printing-medium detection sensor 20 is in the position which can detect the printing medium 4 based on the tip position and width at the time of printing of the printing medium 4 obtained by printing-medium loading operation (S155 shown in drawing 5) (S202).

[0031]When located in the position as which the printing-medium detection sensor 20 cannot detect the printing medium 4, the carriage 9 carrying the printing-medium detection sensor 20 is moved to the position which can detect the printing medium 4 (S203). Next, the existence of the printing medium 4 is detected by the printing-medium detection sensor 20 (S204). Since printing operation will become possible if the printing-medium detection sensor 20 detects the printing medium 4, if the printing-medium detection sensor 20 detects the printing medium 4, the carriage 9 will be moved till the printing starting point (S205), and it will go into printing operation (S207). Moving the carriage 9 to a print direction, this printing operation breathes out ink from the printhead 11, and performs uni-directional printing.

[0032]An end of printing for one band will return the carriage 9 till the printing starting point. The printing medium 4 is conveyed by one band in the meantime (S209), and

printing is started into the new portion located in an image formation area. It carries out by repeating this the operation of a series of, printing operation is continued until it detects the back end of the printing medium 4, and printing is ended (S210). During printing, when the back end of the printing medium 4 is detected (S206), it shifts to printing-medium back end detection processing, a printing-medium back end detection error is emitted (S208), and printing operation is ended.

[0033]Bidirectional printing is explained with reference to drawing 7.

[0034]The distance of the printhead 11 and the printing-medium detection sensor 20 which are shown in drawing 3 in the case of bidirectional printing made distance L longer than the distance E. Thus, by arranging the printhead 11 and the printing-medium detection sensor 20, the printing-medium detection sensor 20 will detect the printing medium 4 of the state in which the printing processing for two times is at least still more possible. Therefore, bidirectional printing, i.e., both-way printing printable also in a backward movement also in the outward moving of the carriage 9, becomes possible.

[0035]First, the existence of the printing medium 4 is detected (S252). When the printing medium 4 is detected (i.e., when the printing medium 4 exists), it is judged whether the printing-medium detection sensor 20 is in the position which can detect the printing medium 4 based on the tip position and width at the time of printing of the printing medium 4 obtained by printing-medium loading operation (S155 shown in drawing 5) (S253).

[0036]When located in the position as which the printing-medium detection sensor 20 cannot detect the printing medium 4, the carriage 9 carrying the printing-medium detection sensor 20 is moved to the position which can detect the printing medium 4 (S254). Next, the existence of the printing medium 4 is detected by the printing-medium detection sensor 20 (S255). Since printing operation will become possible if the printing-medium detection sensor 20 detects the printing medium 4, if the printing-medium detection sensor 20 detects the printing medium 4, the carriage 9 will be moved till the printing starting point (S256), and it will go into \*\* and printing operation (S258). Making the carriage 9 reciprocate, this printing operation breathes out ink from the printhead 11, and performs bidirectional printing.

[0037]After printing (\*\*\*\*\*) of the plus direction is completed, the carriage 9 is moved to the printing starting point of a backward direction. The printing medium 4 is conveyed in the meantime (S259), and printing of a backward direction is started. It carries out by repeating this the operation of a series of, printing operation is continued until it detects the back end of the printing medium 4, and printing is ended (S261). During printing, when the back end of the printing medium 4 is detected (S257), it shifts to printing-medium back end detection processing, a printing-medium back end detection error is emitted (S260), and printing operation is ended.

[0038]Although arrangement of the printing-medium detection sensor 20 mentioned above was effective arrangement for bidirectional printing, the same effect was acquired also in uni-directional printing. That is, since the printing medium 4 of the state in which the printing processing for two times is possible is detectable in uni-directional printing, after the back end of a printing medium is detected, the dirt of the platen 8 (refer to drawing 2) in ink can be prevented by performing printing processing for two times and suspending image formation.

[0039]

[Effect of the Invention] Since the printing-medium detection means carried in the transportation direction upstream portion rather than the printhead among carriages detects the rear end position and width at the time of printing of the printing medium currently conveyed in the transportation direction according to the image forming device of this invention as explained above, The size of a printing medium is detectable with a machinery target or electrically easy composition.

[0040] When a printing-medium detection means is carried in the position which is distant from the 1st delivery beyond the distance which met the transportation direction of the 1st delivery nearest to a printing-medium detection means, and the 2nd most distant delivery among two or more deliveries here, Since image formation can be suspended after forming the picture for one next band at least, dirt, such as a platen in the breathed-out ink, can be prevented.

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is a perspective view showing the outline composition of the plotter which is an example of the image forming device of this invention.

[Drawing 2] It is a perspective view showing the conveying path of the printing medium in the plotter of drawing 1.

[Drawing 3] It is a bottom view showing the carriage with which the plotter of drawing 1 is provided.

[Drawing 4] It is a block diagram showing the outline composition of the plotter of drawing 1.

[Drawing 5] It is a flow chart showing the printing operation by the plotter of drawing 1.

[Drawing 6] It is a flow chart showing the operation at the time of carrying out unidirectional printing using the plotter of drawing 1.

[Drawing 7] It is a flow chart showing the operation at the time of carrying out bidirectional printing using the plotter of drawing 1.

[Description of Notations]

1 Plotter

4 Printing medium

9 Carriage

11 Printhead

11a, 11b, 11c, .... 11x Delivery

20 Printing-medium detection sensor

Distance which met the transportation direction of the delivery 11a nearest to a printing-medium detection sensor, and the most distant delivery 11x among the deliveries of E plurality

Distance of L printing-medium detection sensor and the delivery 11a

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## CLAIMS

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[Claim(s)]

[Claim 1]An image forming device comprising:

A printhead in which two or more deliveries in which ink carries out the regurgitation from each were formed.

Ink is breathed out from said two or more deliveries, having a carriage which carries this printhead and reciprocates to a determined direction, and making this carriage reciprocate to said determined direction, A printing-medium detection means carried in said transportation direction upstream portion rather than said printhead among said carriages which detect width as the length of a printing medium currently conveyed in said transportation direction in an image forming device which forms a picture in a printing medium conveyed in a transportation direction which intersects said determined direction.

[Claim 2]The image forming device according to claim 1, wherein said printing-medium detection means is carried in a position which is distant from said 1st delivery beyond distance which met said transportation direction of the 1st delivery nearest to said printing-medium detection means, and the 2nd most distant delivery among said two or more deliveries.

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[Translation done.]